

# SHEPPARTON TNC 220+

by

MELBOURNE PACKET RADIO GROUP

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ASSEMBLY INSTRUCTIONS  
FOR THE - MPRG KIT - SHEPPARTON TNC 220+

ACKNOWLEDGEMENTS

The SHEPPARTON TNC-220+ board was designed by Mr Ray Gardiner (VK3YNV) from Shepparton, for the development of the Australian Packet Radio Network. As all TNC's come from overseas at present and are expensive, it was decided to produce a local TNC that would allow the Australian Packet Network to be developed under Australian control. To do this it was necessary to have our own hardware and software that could be developed as required and not be forced to use products beyond our control. The price of the TNC could also be kept under control.

Since Ray is a very busy person, he handed the project over to the Melbourne Packet Radio Group to handle all sales and distribution to the Amateur fraternity. Commercial users should contact Ray personally for details on the availability of this unit. This will also free him to concentrate on the next step of the project, that is the Digital Repeater multiport adapter board.

All of this development has been financed by Ray personally and is not cheap. He has done it for the benefit of Radio Amateurs and the dvancement of Australian Packet Radio. MANY THANKS RAY !!!

The MPRG supplys ALL parts in KIT form for the SHEPPARTON TNC-220+. Some parts are PARTICULAR in physical size and cannot be substituted. For the present there will be no bare boards with EPROM sold as it is doubtful that most people will be able to construct the board for anywhere near the kit price MPRG are offering.

The software for this TNC is provided under a license agreement with PacComm Packet Radio Systems, Inc. of the USA, for use in a single TNC, in an Amateur and non-commercial installation. PacCom Packet Radio Systems Inc. have no liabilities for the fitness of the software to operate correctly in the supplied Kit, nor are they able to provide any advice, assistance with problems or updates to the software supplied with this kit.

Any questions or queries regarding the software should be directed to MPRG at P.O.Box 299, St Albans, Victoria, Australia 3021. or VK3AVE @ VK3RPA.

The readiness of PacComm Packet Radio Systems, Inc. to license their software for use in this experimental TNC pending the release of an indigenous Australian package is greatly acknowledged.

The MPRG undertakes to provide to the original purchaser of this kit, an option to upgrade to Australian developed software at no cost. When this software is released, purchasers will be notified of the conditions relating to this upgrade.

PARTS LIST

Each kit of parts supplied by the MPRG contains the following parts (or their equivalent). BE WARNED NOW that most items must meet PHYSICAL as well as electrical compatibility, you should not substitute any parts that were supplied by MPRG. Please CHECK NOW that ALL parts in the list are ACTUALLY present and NONE are missing.

P.C. BOARD TYPE TNC-220+

CONNECTORS

J1 pcb mount 5 pin DIN socket (180 degree)  
 J2 pcb mount DB25S socket.  
 J3 pcb mount DC power jack 2.5mm.  
 P1 5 pin DIN plug (180 degree).  
 P3 DC power plug.

IC SOCKETS

As the standard of construction of these kits is beyond our control, we cannot GUARANTEE the ability of the purchaser to directly solder the integrated circuits into the PCB without causing faults or having the technical expertise in any fault finding necessary, we have supplied machined IC sockets.

|              |              |              |
|--------------|--------------|--------------|
| 2 of 40 pin. | 3 of 28 pin. | 2 of 16 pin. |
| 6 of 14 pin. | 5 of 8 pin.  |              |

INTEGRATED CIRCUITS

|                       |                  |               |                  |
|-----------------------|------------------|---------------|------------------|
| 1 of LM7805           | regulator        | 1 of ICL7662  | voltage inverter |
| 1 of ICL7660          | voltage inverter | 1 of D1213C   | Battery Backup   |
| 2 of NE555            | timer            | 1 of Z80A     | CPU              |
| 1 of 74LS164          |                  | 1 of 27C256   | EPROM            |
| 1 of 62256 (43256)    | LP ram           | 1 of Z8530    | SCC              |
| 1 of AMD 7910         | modem            | 1 of 74HC4020 |                  |
| 2 of 74LS04           |                  | 1 of 1488     | line driver      |
| 1 of 1489             | line receiver    | 1 of 74LS138  |                  |
| 1 of 74LS00 or 74HC00 |                  |               |                  |

RESISTORS

All resistors are 0.25 Watt 5% (unless noted).

|                           |                          |
|---------------------------|--------------------------|
| 3 of 1M Ohm               | 4 of 10k Ohm             |
| 3 of 3k9 Ohm              | 5 of 1k Ohm              |
| 8 of 470 Ohm              | 1 of 100 Ohm             |
| 1 of 10k Ohm SIP (10 pin) | 2 of 10k Ohm LIN trimpot |

CAPACITORS

|              |                  |               |                  |
|--------------|------------------|---------------|------------------|
| 1 of 1000uF  | 25V ELECTROLYTIC | 1 of 22uF     | 25V TANT         |
| 4 of 10uF    | 25V TANT         | 3 of 1uF      | 25V TANT         |
| 1 of 0.047uF | 50V CERAMIC 473Z | 1 of 0.0022uF | 50V CERAMIC 222  |
| 1 of 100pF   | 50V CERAMIC      | 2 of 330pF    | 50V CERAMIC 331M |
| 13 of 0.1uF  | 50V MONO .1M     | 5 of 0.01uF   | 50V MONO 103     |

TRANSISTORS and DIODES

|                        |                          |
|------------------------|--------------------------|
| 1 of 2N3904 Transistor | 1 of VN10 FET            |
| 4 of 1N4004 Diodes     | 4 of 1N4148 Signal diode |
| 1 of 1N4752 18V Zener  | 3 of LED RED             |
| 1 of LED YELLOW        | 2 of LED GREEN           |

MISCELLANEOUS

- 2 of 10pin MALE DIL header (0.1x0.1 spacing)
- 1 of 3pin MALE SIL header (0.1 spacing)
- 4 of Shorting block (jumper)
- 1 of Heatsink
- 1 of 4.9152 MHz Crystal HC-18U.
- 4 of 3mm x 6mm SCREW
- 4 of 3mm NUT

Please examine the fit of the DB25 socket and it's associated nuts and bolts, two options are provided for different connectors or wire in, as required. You should ensure that the socket fits and that the bolt holes suit your connector, drilling out the holes if necessary. Don't solder the connector in until later and don't be too rough and take out too much of the earth track.

ADDITIONAL ITEMS REQUIRED

A LOW wattage (about 15W) or temperature controlled soldering iron with a FINE tip and small diameter (1.0mm) rosin cored 60/40 solder.

Small diagonal side-cutters and needle nose pliers.

An accurate voltmeter or multimeter.

Small amount of insulation tape.

Twin hookup wire for power lead

Suitable shielded wire and plugs for radio connection.

ASSEMBLY INSTRUCTIONS

We assume that the person constructing this kit has had previous experience in soldering with a low wattage soldering iron on similar high density PC boards. If you do not have this experience, then we recommend that you find someone that has or make an approach to the MPRG or another amateur, for assistance.

To help people that may not be able to assemble the board in one sitting, space has been provided so that the last instruction completed can be readily found, if construction is interrupted. These are the square brackets at the start of every NEW task. If you tick or cross these boxes you will find the whole project simpler to complete successfully.

Good soldering technique requires the soldering iron tip to be kept clean and bright by wiping it frequently on a damp sponge or cloth.

Dressing the resistors and components left to right and up and top to bottom, helps to make the board look neat and also can assist if troubleshooting is required. References in this text will normally assume the board is held horizontally so that the connectors are to the left and the silkscreen is easily read.

#### CIRCUIT BOARD ASSEMBLY

[ ] Check ALL parts in the component list are present.

[ ] Visually inspect the PC board for any track shorts or damage that may have occurred; THIS IS A MUST, as it will show any manufacturing faults. Do not be concerned unduly with the tracks around U11 being incomplete, these are provided to change speeds and are not needed in normal operation. They are provided for later experiments.

Pay particular attention during this inspection, to the tracks going between IC pads. Use a strong light behind the board, flaws will show as irregular and ill defined tracks.

Insert and solder the following RESISTORS, then trim their leads as you fit them. The resistors will fit best if the leads are bent, gently in the fingers, at the body.

|             |               |               |                |
|-------------|---------------|---------------|----------------|
| [ ] R13 10k | [ ] R10 1M    | [ ] R11 10k   | [ ] R12 1k     |
| [ ] R6 1M   | [ ] R22 10k   | [ ] R23 3k9   | [ ] R7 100     |
| [ ] R26 1M  | [ ] R1 470    | [ ] R2 470    | [ ] R27 3k9    |
| [ ] R28 3k9 | [ ] R14 1k    | [ ] R15 1k *  | [ ] R16 470    |
| [ ] R17 470 | [ ] R18 470   | [ ] R19 470   | [ ] R20 470    |
| [ ] R21 470 | [ ] R24 1k ** | [ ] R25 1k ** | [ ] Rx 10k *** |

\* Exercise care that you insert this resistor in the correct holes as per the silkscreen and not in an adjacent vacant plated through hole.

\*\* Resistors R24 and R25 are used in the TTL level signals to the J2 connector and if the TTL function is NOT required, it is best to leave them out as a safety precaution, even though the pins used here are seldom used on most RS232 connectors. These may be added later, even underneath the board, if required.

\*\*\* Rx - This is the GAIN determining resistor of the Op Amp in the receive data line. In MOST cases 10k is a suitable value.

Insert and solder the following MONOLITHIC CAPACITORS, then trim the leads.

|                                     |                                     |                                     |                                     |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> C22 0.01uF | <input type="checkbox"/> C24 0.01uF | <input type="checkbox"/> C25 0.01uF | <input type="checkbox"/> C26 0.01uF |
| <input type="checkbox"/> C27 0.01uF | <input type="checkbox"/> C3 0.1uF   | <input type="checkbox"/> C5 0.1uF   | <input type="checkbox"/> C10 0.1uF  |
| <input type="checkbox"/> C12 0.1uF  | <input type="checkbox"/> C13 0.1uF  | <input type="checkbox"/> C14 0.1uF  | <input type="checkbox"/> C17 0.1uF  |
| <input type="checkbox"/> C18 0.1uF  | <input type="checkbox"/> C19 0.1uF  | <input type="checkbox"/> C28 0.1uF  | <input type="checkbox"/> C31 0.1uF  |
| <input type="checkbox"/> C32 0.1uF  | <input type="checkbox"/> C33 0.1uF  |                                     |                                     |

☐ READ NOTE \*\*\* When inserting the IC sockets, align the notch or bevel in the socket with the notch shown on the component silk screen on the PC board. Also when you solder the socket in, it is best to solder two diagonally opposite pins first, check that it is seated properly, then solder the remaining pins. If it is not seated properly you can remedy this by reheating the pins while applying SLIGHT pressure to the socket. If you need to straighten any of the socket pins, use care, you could snap a pin off or distort the socket.

Insert and solder the following IC sockets.

8 pin

☐ U2    ☐ U3    ☐ U4    ☐ U13    ☐ U14

14 pin

☐ U6    ☐ U12    ☐ U15    ☐ U16    ☐ U17    ☐ U19

16 pin

☐ U11    ☐ U18

28 pin

☐ U7    ☐ U8    ☐ U10

40 pin

☐ U5    ☐ U9

☐ Fit and solder in the SIP resistor pack 10k.

\*\*\*NOTE the dot is pin 1 and this should be placed to the left of the board, the din connector end.

Insert and solder the following TANTALUM CAPACITORS, (NOTE POLARITY) then trim the leads.

|                                  |                                  |                                  |                                     |
|----------------------------------|----------------------------------|----------------------------------|-------------------------------------|
| <input type="checkbox"/> C2 1uF  | <input type="checkbox"/> C4 1uF  | <input type="checkbox"/> C11 1uF | <input type="checkbox"/> C23 22uF * |
| <input type="checkbox"/> C6 10uF | <input type="checkbox"/> C7 10uF | <input type="checkbox"/> C8 10uF | <input type="checkbox"/> C9 10uF    |

\* +ve towards the bottom of the board

☐ VR1 10k    ☐ VR2 10k

Insert and solder the following CERAMIC capacitors, then trim the leads.

[ ] C29 330pF      [ ] C30 330pF      [ ] C20 0.0022uF  
[ ] C21 0.047pf

Do not solder in C16 - See notes in INITIAL CHECKOUT and CONFIGURATION, as this capacitor may not be needed and will be "selected on test".

Do not at this stage solder in C15, it may not be required in your application and may be added later. The function of this resistor is to limit the Oscillator level, where this may cause interference problems. However, it must be carefully selected to ensure reliable oscillation.

Insert and solder the following DIODES and TRANSISTORS, (NOTE POLARITY) then trim the leads.

[ ] D1 1N4148      [ ] D2 1N4148      [ ] D3 1N4148      [ ] D4 1N4148 \*\*  
[ ] D11 1N4752      [ ] Q1 2N3904 \*      [ ] Q2 VN10 \*      [ ] 4x1N4004 \*\*\*

\* The flat face goes to the left, or towards the DB25 plug.

\*\* Be careful to fit this diode to the silk screened holes only.

\*\*\* Cathode/Bar closest to DB25 connector for all four diodes.

Insert and solder the following MISCELLANEOUS items, then trim leads if necessary.

[ ] Insert the 25 pin D connector (J2) using the two 3mm screws and nuts. NOW solder the pins.

[ ] Insert and solder the 5 pin DIN socket (J1).

[ ] Insert and solder the 2.5 mm DC power jack (J3).

[ ] J5 10 pin DIL male stakes.

[ ] JPAL 3 pin SIL male stakes.

[ ] Jx 10 pin DIL male stakes.

[ ] Mount the HEATSINK to the PC board using the hole closest to the middle of the PC board and one of the two remaining 3mm screws and nuts. Bend the leads of the 7805 down at the point where they narrow, check the fit and then, insert the 7805 voltage regulator facing the OUTSIDE of the PC board onto the HEATSINK so that the MOUNTING hole and the REMAINING HOLE in the HEATSINK are in line. Use the last 3mm screw and nut to fasten the regulator, heatsink and PC board together. If you have some you could apply some thermal compound paste between the regulator and the heatsink; this is not essential, but if you have some use it, if not don't worry. Now solder the three legs of the regulator.

[ ] Insert and solder the capacitor C1, (NOTE POLARITY) and trim the leads.

[ ] Insert the crystal and bend it until it is flat on the board and aligned with the outline. Remove the protection from the double sided tape and mount the xtal on the outline, solder the crystal leads in place using a minimum of heat.

[ ] The LEDs may now be installed.  
RED for RST, PTT and CON.  
GREEN for DCD and PWR.  
ORANGE for STA.

Since all users will NOT need the expansion connector J4. A strip of insulation tape may be placed over the connector pads and the LEDs mounted so that they hang over the end of the PC board. If this method is used then there should be little or no lead to trim off. NOTE the POLARITY of the LEDs is achieved by connecting their longest leads to the top connections.

[ ] Make up a power lead, using the supplied plug and user supplied hookup wire. Colour coding of this lead is not required, as the TNC will operate with DC or AC power sources.

[ ] Make up a suitable connector for the radio using the supplied 5pin DIN connector and user supplied cables and plugs. The DIN connector depicted on the supplied circuit, standard pin numbers are:

- 1 Microphone Audio.
- 2 Ground, audio and PTT common.
- 3 Push to Talk (PTT).
- 4 Receive Audio.



INITIAL CHECKOUT OF TNC-220+

Carefully examine the PCB for shorts or solder bridges between pins and tracks. THIS IS MOST IMPORTANT as any shorts will cause the TNC to fail.

VOLTAGE CHECKS

[ ] Check of the +ve 5 volt regulated voltage. Do NOT at this stage plug any ICs or the battery backup into their sockets. Similarly no links are required at this stage.

[ ] Connect power to J3, 9 to 12 volts is ok, (the polarity does not matter) and observe that the the power led is lit. With a multimeter check that 5 volts is present between pin 3 of U1 and ground. U1 is the 7805 regulator mounted on the finned heatsink. Pin 3 is the pin farthest away from the bridge rectifier. A suitable ground point is found on the bolt holding the heat to the pcb, or the middle pin of U1.

[ ] If 5 volts is not present and the 7805 is getting hot, then there is a short between the supply rail and ground, which you must correct before continuing. If 5 volts is measured then proceed to the next stage.

[ ] CAUTION Disconnect power, by unplugging the lead, before continuing.

[ ] Plug U2 (ICL7662) and U3 (ICL7660), -ve rail generators into their respective sockets. Make sure that you get all the IC pins into the sockets and that they don't fold underneath the IC.

[ ] Check of the negative rail generators. Connect power again, and check for -5 volts on pin 5 of U3 and for -9 to -12 volts on pin 5 of U2. The 2nd reading may be anywhere in this range depending on exactly what input voltage you are using. If all is well, then this stage is ok, if not try to ascertain what the problem is, make sure that the ICs are plugged in the right way, that is with the notch or dot facing the DB25 socket, and that there is + 5 volts on pin 8 of U3 and from +9 to +12 volts on pin 8 of U2.

[ ] CAUTION Disconnect power, by unplugging the lead, before continuing.

OSCILLATOR CHECK

[ ] Check of the clock oscillator and frequency dividers. Plug U12, (74LS04) and U11, (4020) into their sockets with the notch or dot facing away from the DB25 connector. Apply power and check for oscillation.

[ ] The simplest way to do this is to measure the voltage on pin 3 of U11, (4020). This pin should have a 300 Hz square wave on it and the DC voltage will read somewhere from 2 to 3 volts. If the voltage reads +5v or nil then recheck the connections around U11 and U12.

[ ] If you have a HF receiver that will tune around 5 MHz then loosely couple a wire from the aerial to near U12 and the oscillator will be heard on 4.9152 MHz if it is going.

[ ] If the oscillator has a spurious harmonic that interferes with your radio or operating frequency, then disconnect power and solder in C16, 20 pf across the crystal (not supplied). Proceed to the next stage when you are satisfied, that the oscillator is going.

[ ] CAUTION Disconnect power, by unplugging the lead, before continuing.

#### RESET CIRCUIT

[ ] Plug in U4, 555 timer with the notch facing towards the DB25 connector. Apply power and measure the voltage on pin 7 of the 555. This pin should show a 1hz square wave swinging from greater than 4 volts to zero, also the reset led should be slowly flashing.

[ ] CAUTION Disconnect power, by unplugging the lead, before continuing.

#### PROCESSOR CHECKS

[ ] Plug in the following ICs, taking care to not bend any of the pins underneath:

|     |          |  |
|-----|----------|--|
| U5  | 280      | CPU Notch away from DB25 connector.          |
| U9  | 8530     | SCC Notch away from DB25 connector.          |
| U8  | D1213C   | Battery Backup, for RAM, notch away.         |
| U8  | 43256    | 32k CMOS Static Ram Notch away from DB25.    |
| U10 | AMD 7910 | MODEM  |
| U16 | 1488     | Line driver. Notch facing DB25 connector.    |
| U17 | 1489     | Line receiver. Notch facing DB25 connector.  |
| U18 | 74LS138  | Port decoding Notch away from DB25.          |
| U14 | 555      | Watch Dog timer and PTT led driver.          |
| U15 | 74LS04   | Led driver Notch facing away from DB25.      |
| U6  | 74LS164  | SCC interrupt timing Notch away from DB25.   |
| U19 | 74LS00   | SCC read and INTACK generation Notch facing. |
| U7  | 27256    | 32k EPROM Notch away from DB25 connector.    |

\*\*\* Note you will not insert U13, the 1458 OP-AMP until after the initial checkout and only then if the application requires it. Please see the later discussion.

Once again, carefully check that all the ICs are inserted the correct way into their sockets, look at the silkscreen if in doubt. This is most important, as damage to the ICs may result if they are plugged in the wrong way or a pin is not properly seated.

[ ] Initial test of Digital Ccts. Connect a Terminal configured as DTE to the DB25 connector, with the terminal set for 1200 bauds, 8 bits, even parity, apply power. At this stage you only need an earth and receive and transmit lines, in your final installation you might want to set the computer/TNC up for hardware handshaking. Most of the leds will initially light until the reset cct has operated, then all except the power led should go out.

After a few seconds a sign on message, similar to the following, should appear:

|J

bbRAM loaded with defaults

|A

Pac-Comm Packet Radio Systems TNC-220  
AX.25 Level 2 Version 2.0  
Release 1.1.5 11/13/87 - 32K RAM  
Checksum \$A6  
cmd:

Type mycall

eg. cmd:myc

You should get the following:

MYCALL NOCALL

Type mycall ##### (##### insert your own call)

You should get the following:

cmd:mycall ##### (##### your own callsign)  
MYCALL was NOCALL

Type restart and you should see the the signon notice again. Type myc again and this time the TNC should return your call. You could also type disp and the TNC will dump the defaults, shown on the attached sheet, to your terminal.

At this stage you can try out a few of the commands and get a feel of driving the TNC, even make some deliberate errors and notice the results. You cannot hurt the TNC and can always reset or restart to get back to the initial start point.

If nothing appears on the screen try powering down the unit and then apply power again, discuss the problem with a friend, he might spot the obvious error that you have been missing or get a message to us. There is also a discussion on troubleshooting in this manual.

#### DIGITAL LOOPBACK TEST

[ ] Link pins 1 & 2 of J5 with one of the link plugs supplied. These are the top right hand pins of J5. This connects the transmitter of the SCC to its own receiver.

[ ] Apply power again and from the cmd: prompt type FULLDUP ON. This tells the SCC to send and receive at the same time. Type CO callsign, where callsign is your own call. This will cause the SCC to connect itself.

The PTT led should blink, the connect led illuminate and a message indicating that a connection has been established should appear on the screen.

\*\*\* CONNECTED to ##### (##### your callsign)

**NOTE:** if the command prompt is not present on the screen type control C, this means type the letter C whilst pressing the Control key.

If the TNC passes this test then continue to the next one, which is the ANALOG TEST.

[ ] CAUTION Disconnect power, by unplugging the lead, before continuing.

#### ANALOG TEST

This is the final part of the TNC assembly, not far to go now and you are finished and can start having fun.

[ ] Using two of the shorting blocks, link the 2nd and 3rd pair of pins on the plug JX, behind the modem chip, starting from the pair closest to the DB25 connector. The blocks should be up and down and the final configuration should be, the first pair open circuit the next two pairs shorted and the last <sup>two</sup> pair open circuit.

[ ] Remove the link from pins 1 & 2 of J5 and use it to link pins 2 & 3. This connects the SCC to the MODEM.

[ ] Link together the loop and jpal link to the left of the modem chip. This connects the modems output to its input and you can connect to yourself by use of the FULLDUP ON instruction, as in the digital test. Apply power and carry out the fulldup test, also test a few commands and note their effect.

[ ] CAUTION Disconnect power, by unplugging the lead, before continuing.

[ ] Return the JPAL link to normal.

[ ] Make up a short cable to connect the Tnc to your FM radio using the pin connections shown on the circuit. Tune to a channel where there is packet activity or enlist the aid of a fellow packeteer to give you a test signal.

#### RECEIVER ADJUSTMENT

[ ] Apply power to the TNC and measure the voltage present on pin 5 of the 7910. This should be zero volts.

[ ] Connect the Tnc to the radio with the cable. Turn on the transceiver and adjust the volume control to the normal listening level. Whilst receiving packets, measure the AC voltage present on pin 5 of the 7910. Adjust VR2 for a reading of between 1 to 3 volts using your multimeter on AC. The modem chip is very sensitive and can work down below 1 volt.

The 7910 has automatic AGC and can handle a wide range of input signals, but better performance will be obtained with inputs in the range 1 to 3 volts. If all is well you should be seeing packets displayed on the terminal.

If you are not receiving packets and the voltage is too low, then you will have to use the 1458 OP-AMP and make some circuit cuts and jumpers as follows.

[ ] CAUTION Disconnect power, by unplugging the lead, before continuing.

[ ] \*\*\*\* Note only required if you are getting insufficient drive from your radio.

[ ] Cut the track labelled K1 on the foil side, near the Rx level pot.

[ ] Install a 1458 Op-Amp in IC U13.

[ ] Apply power and adjust the audio level on pin 5 of the AMD 7910 to between 1 and 3 volts. You may have to increase the value of Rx.

#### TRANSMITTER ADJUSTMENT

[ ] This will almost always require the assistance of another amateur unless you have another 2 FM rig and can listen to your own packets. Disconnect the radio from the TNC. Press the return key on the terminal a few times to cause the TNC to send packets. This will cause the PTT led to blink.

[ ] With a multimeter set to AC, measure the voltage on pin 8 of the 7910, a reading of .5 to 1v is normal. Reconnect the radio to the TNC.

[ ] Press the return key on the terminal and the PTT led should briefly blink and the FM rig should briefly transmit.

[ ] Adjust VR1 until the received audio from the transmitted packets is similar in volume to other packet stations in the area. This is not a critical adjustment. Continue to press the return key to get more packets. This method in fact transmits a CQ.

[ ] If you have access to a deviation meter then a deviation of approx. 3 Khz is optimum.

[ ] This completes the construction phase of the TNC-220+.

For more information on the operation of the unit consult the enclosed software instructions, or better yet talk to and visit a friend to see how it all works. As this document matures and given user feedback, we hope to provide more operating notes and hints for specific computer/radio combinations.

When mounting the TNC in a box, bear in mind that in the future additional plug in boards containing for example higher speed modems, extra radio ports will become available, so leave room for them. The additional boards plug into the expansion connector J4.

VHF OPERATION

The simplest and fastest way to connect the TNC to a radio is to, connect the TNC audio output to the MIC input, and the Speaker output to the TNC audio input.

Connect the PTT line from the TNC to the RADIO PTT line.

Packet activity is mostly on 2M FM in most major cities and common frequencies are 147.600 Mhz, for local working and 147.575 Mhz for working outside the city area.

HF OPERATION

For HF operation, the TNC should be connected to the audio, mic and PTT lines, as in VHF operation.

The TNC must be set to operate at a lower baud rate. Set the Baud at 300 and Select PORT 1.

TX/RX Tuning at HF is critical and requires perserverance. To set your transceiver on the correct frequency, you may find it easy to tune close to a known HF packet frequency and fine-tune until you can decode the packets.

HF packet is generally found around 14.107 - 14.111 and 10.149 select LSB and tune the radio to 10.14935 and you should decode packet BBS activity without further tuning.

Optimum Parameters for HF are:

PACLEN 80  
MAXFRAME 2  
FRACK 3  
TXDELAY 30  
RETRY 10

Packet is active on other bands, the two mentioned above are the most active.

GENERAL NOTES ON FAULT FINDING

The TNC is in effect a small computer. On most of the lines and pins in the TNC are high speed TTL signals which usually require a CRO to easily see. However a normal multimeter can usually be used to get a basic indication of what is going on.

TTL signals exist in 1 of 2 states, high or low. High usually means > 4 volts, low means < 1 volts. A line which has high speed ttl signals will usually cause an ordinary multimeter to read somewhere in between.

Lines which should have high speed data on them are as follows. All of the address lines, that is the lines marked A0 to A15 on the cct. All of the data lines, ie those marked D0 to D7 on the cct. The control lines M1, RD, WR and MREQ. The clock line.

Lines which are normally high are. RESET, RTS and CTS. These lines go low when transmitting.

Also remember that the TNC contains a large number of high frequency signals which can play havoc with HF radios. If you wish to reduce the radiation from the TNC to a minimum then mounting the unit in a metal box with proper screening of all cables will help a lot. If only VHF operation is required then the radiation will be much less of a problem.

Notes on power supplies. The TNC is designed to operate with supply voltages from 9 to 12 volts. If it is known that the TNC will be required to operate on higher voltages, then it will be necessary to increase the size of the heatsink on the 7805 regulator, or to externally heatsink the regulator.

Note on the use of C15. This capacitor is designed to reduce RFI from the TNC if it is a problem. However, it is recommended that you do not use it unless absolutely necessary as it will reduce the reliability of the crystal oscillator cct.

END OF CONSTRUCTION NOTES  
HAPPY PACKETEERING

SHEPPARTON TNC 220+  
OPERATING COMMANDS & INSTRUCTION SET  
Pac-Comm VERSION 1.1.5

Being a computer in its own right, the TNC220+ has its own operating system burned into the EPROM and this system is programmable within limits. To enter this "COMMAND MODE" you must have a computer connected to the TNC and be able to send a COMMAND character, <CTRL-C>. In return, the TNC will reply cmd: indicating that it is ready to receive instructions or to provide you with settings to parameters stored in the EPROM/RAM.

Commands to the TNC may be entered in upper or lower case and must finish with a carriage return <CR>, the TNC will always respond to the entry, either with the old parameter setting eg. CONOK was ON, or will return a message indicating it doesn't understand ?EH, or that you have not entered enough parameters ?BAD. Most commands will return you to the command prompt ready to enter a new command, excepting for those immediate commands which will change the operating MODE of the TNC, eg CONVERS.

You do not have to enter the whole command, a shortened mnemonic is generally available for each command and the following discussion of the command set is ordered alphabetically by these mnemonics.

All of the commands have default settings, parameters which are used on initial power up and these parameters may be reset or changed as the user requires. Where a parameter is given as n, this indicates a numeric value and may indicate an ordinary decimal number or a hex \$ value. When ordinary text is a valid parameter, then the following discussion uses the terminology <text>. The use of the ; symbol between parameters means that one of the parameters is required.

Where there may be multiple parameters following a command, eg. a list of callsigns, these must be separated by a blank space or optionally the comma symbol.

Callsigns required as parameters, may include an optional sub station identification (SSID), a decimal no 0 to 15. Where an SSID is used it is entered eg. VK3RPA-1 and if a call is entered without an SSID eg. VK3RPL, then an SSID of 0 is assumed.

The layout followed for the command listing is:

FULL COMMAND (MNEMONIC IN UPPER CASE)                      DEFAULT

EXPLANATION OF THE INSTRUCTION

PERMITTED PARAMETERS WITH EXPLANATION

HELPFUL NOTES AND SUGGESTIONS



---

8bitconv ON|OFF                      Default OFF

---

Enables the transmission and reception of 8-bit data in CONVERSE MODE.

- ON - The most-significant bit of data transmitted or received in CONVERSE MODE is left as is.
- OFF - The most-significant bit of data transmitted or received in CONVERSE MODE is set to 0.

If you want to transmit or receive special graphics characters, 8bitconv must be ON.

---

AUtoLf ON|OFF                      Default ON

---

Enables insertion of line feeds/carriage returns in received data, as well as echoing those that are typed in.

- ON - The TNC inserts a line feed after every carriage return ( <CR> ).
- OFF - This feature is disabled.

Controls carriage return characters received as well as those typed in.

If the "sign on" message is typed over, you should set this ON, and if it is double spaced, set it OFF.

This command only affects the display, not sent packets. If you want to add linefeeds to outgoing carriage returns use LFadd.

---

AWlen n                                  Default 7

---

Word length for serial I/O to terminal port.

n = 7 or 8 (no of data bits in word from terminal).

For most general packet operations eg. RBBS and terminal to terminal, set to 7. If you send 8 bit words to the TNC in COMMAND MODE, the eight bit is normally ignored regardless of this setting.

To transmit files etc. you need to use TRANSPARENT MODE and set this to 8. Does not take effect until after a power off or RESTART.

---

Ax2512v2 ON|OFFDefault ON

---

Determines the protocol used in packet mode.

- ON - The TNC uses version 2 of the AX.25 protocol.
- OFF - The TNC uses the old (version 1) protocol.

Version 2 of the AX.25 Packet Radio Protocol is currently the most commonly used packet radio protocol. Unless you need to talk to a very early TNC1, leave this ON.

---

AXDelay nDefault 0

---

Auxiliary delay, for voice repeater use, this value specifies how much extra time (in addition to the normal delay set by TXdelay) that the TNC waits, after keying the transmitter, before data is sent.

n = 0 to 180, in units of 10ms.

This is handy if your transmitter needs extra time to stabilize its frequency, or if you are using a conventional voice repeater with a slow mechanical relay. It should be used when the related parameter, TXdelay, cannot provide an adequate time delay. TXdelay will usually be enough for TNC-to-TNC communication - AXDelay is intended for other devices and is usually 0.

The TNC sends flag characters for time AXDelay and you can monitor these on air as a "buzz", followed by the raspy data of the packet frame itself.

---

AXHang nDefault 0

---

Auxiliary hang time.

n = 0 to 20, in units of 100ms.

This value can be used to increase channel utilization when an audio repeater with a hang time greater than 100 ms is used. If the repeater squelch tail is equal to the hang time set by this command, the TNC will not add the AXDelay time for packets to be sent before the tail has dropped.

---

BAudAn Immediate Command

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BAud is an immediate command which displays both the terminal and radio data rates. The command may be used at any time without changing the data rates.

The EPROM defaults and circuit implementation, set this to 1200 Baud for both the terminal and the radio modem.

The initial display shows the current data rate settings, the second part of the display is a list of supported data rates with a command letter for each and finally, there is the word Select?. To change any of these rates, enter the appropriate letter and the menu will be re-displayed.

cmd:baud

Radio : 1200  
Terminal : 1200

## Baud Rates

| Radio  | Terminal |
|--------|----------|
| -----  | -----    |
| A- 300 | G- 300   |
| B- 600 | H-1200   |
| C-1200 | I-2400   |
| D-2400 | J-4800   |
| E-4800 | K-9600   |
| F-9600 |          |

Q-Make changes

Select?

To exit from the menu and make the selection permanent, type the letter Q.

For HF operation, you will need to select A from this menu for 300 baud operation, and select the Port command to 1.

If you change the terminal rate, you will have to change your terminal program communications rate immediately after, in order to regain communications with the TNC.

---

BBSmsgs ON;OFFDefault OFF

---

This command controls how the TNC displays certain messages in COMMAND and CONV MODEs.

ON - causes some TNC messages to be preceded by a <CR>  
 OFF - messages are handled normally.

The messages affected when this command is ON are described below:

```

*** CONNECTED to          - newline added before ***
*** DISCONNECTED          "
*** retry limit exceeded  "
*** xxxx Busy             "
*** FRMR sent              "
*** FRMR rcvd              "
*** Connect request xxxx   "

```

The BBSmsgs command is primarily useful for host operation, with WORLI and similar bulletin board systems that require link status.

The connect request message is omitted during the BBSmsgs MODE. This should be most useful for preventing corruption of messages when forwarding with small frames.

---

Beacon Every;After nDefault Every 0

---

#### Beacon MODE

E - Beacon message BText is transmitted regularly.  
 A - Beacon message BText will be transmitted once, after the specified time with no packet activity.  
 n = 0 to 250 in 10 sec intervals, 0 disables beacon.

The message stored as BText will be transmitted Unproto (via whatever digipeat path is specified by the Unproto parameter) addressed to "BEACON". If BText is blank no beacons are sent.

If Every is set, the beacon will be transmitted every n\*secs. A useful method of sending test signals.

If After is specified, the beacon will transmit only after the nominated interval of link inactivity.

---

BKondel ON|OFFDefault ON

---

## Backspace on Delete

- ON - The sequence <backspace> <space> <backspace> is echoed whenever a delete character is entered at the keyboard.
- OFF - The <backslash> (\) is echoed when a character is deleted.

May be needed if you are using an older non erase on backspace terminal. eg an old computer line printer.

---

BTextDefault blank

---

## Beacon text

text = any text, characters and spaces up to 120.

The beacon text is a short message that is transmitted automatically at the time interval set by parameters to the Bcommand. Beacons are transmitted using the Unproto path.

To send a multiple line beacon you need to embed the <CR> character within the text, by preceding it with the pass character. See the PASSs command.

---

BUDlist ON|OFFDefault OFF

---

## Buddy List

- ON - Ignore frames from stations not in LCAlls.
- OFF - Ignore frames from stations in LCAlls

This command works in conjunction with LCAlls and Monitor ON, to determine which packets are displayed.

When ON, you may listen for calls from someone on the LCAlls list, when in the CONVERSE MODE or alternatively with it OFF, you could screen out local BBS packets while displaying other channel activity.

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CALibraAn Immediate Command

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## Calibrate

- <space> - Switch the transmitter to the other tone.
- D - Alternate between the two tones at the radio baud rate.
- K - Toggle the PTT line.
- Q - Quit the calibrate routine.

Not used normally, but could be used for test or experimental purposes.

---

CANline n

Default \$18 &lt;CTRL-X&gt;

---

Changes the cancel-line input editing character.

n = 0 to \$7F, an ASCII character code.

---

CANPac n

Default \$19 &lt;CTRL-Y&gt;

---

Changes the cancel-packet input editing command character.

n = 0 to \$7F, an ASCII character code.

---

CBell ON|OFFDefault OFF

---

Connect Bell.

- ON - A bell character is sent on connect
- OFF - No bell character for connects.

MFilter has no effect on this command, if set ON a bell will indicate connects, even if the MFilter is set to delete \$07 (BELL).

Default 30

CHeck packet automatic time-out.

n = 0 to 250, in units of 10 sec.

A value of 0 disables this function. If the station you are connected to "disappears", the TNC will try to clean up the link after a specified time interval. For a value greater than 0, the TNC will wait for the specified time interval, for the other station to send some data. If no data is received, the TNC will (for a version 1 link) try to re-establish the link by sending connect frames. If the link is a version 2.0 link, the TNC will test the link. After doing this RETRY times with no response, it will start sending connect request frames. If this is unsuccessful, the REtry number will be exceeded and your station will time out and be available for a new connection.

Default 0

Adjusts the real time clock.

n = 0 to 65535

A value of 0 means that no correction factor is applied, else the correction factor is:

$$\text{Relative clock speed in \%} = 100 - ( 9.1667 * ( 1 / n ) )$$

Default 1

TRANSPARENT MODE time-out value, in order to allow escape to the COMMAND MODE and yet allow the sending of any character.

n = 0 to 250 in seconds. If this value is 0, then the only way to return to the COMMAND MODE is to send a break signal, or to reset the power switch.

To exit to COMMAND MODE, three COMMAND MODE characters must be sent after n seconds of no characters, and within n of each other, followed by a delay of n.

---

CMSg ON|OFFDefault OFF

---

Enables the sending of CText whenever a connect is accepted.

ON - on receipt of a connect request, CText is sent.  
OFF - CText is not sent.

Used to leave a message when the station is unattended, or you are unable to conduct a keyboard QSO.

If you initiate a Cconnect, no CText message is sent.

---

MSGDisc ON|OFFDefault OFF

---

Disconnect after sending CText.

ON - after sending CText, a disconnect will be initiated.  
OFF - disconnect will not be initiated after CText.

---

COMmand nDefault \$03 <ctrl-C>

---

Sets the COMMAND MODE entry character.

n = \$0 to \$AF, an ASCII character code.

This is the character used to enter the COMMAND MODE from the CONVERSE MODE, see also the discussion on CMdtime for its use in exiting TRANSPARENT MODE.

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CONMode Convers|TransDefault CONVERSE

---

Determines the MODE the TNC is placed in as the result of a connect request or user initiated.

CONVERS - automatically enters the CONVERSE MODE.  
TRANS - enters TRANSPARENT MODE on connect.

For most operations you will use the CONVERSE MODE.



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Connect call1 Via call call An Immediate Command

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This command requests that a connection be established with another station. The call may include an SSID and may be followed by a V and a further list of stations to digi-peat through.

eg. C VK3RPA V VK3RPS

---

CONOk ON|OFFDefault ON

---

When ON, normal connects are allowed and a normal connect message is sent.

ON - connects are allowed.

OFF - connects are answered with station busy message.

Useful if you still want to act as a digi-peater but don't want to be connected to.

---

CONPerm ON|OFFDefault OFF

---

Allows you to establish a connection permanently, through RESTART, power OFF/ON and the normal REtry limitation.

ON - disconnect of the current connection is not allowed.

OFF - disconnects are allowed.

May be used in certain net-working applications, meteor scatter, or where the path is unreliable.

---

CONStamp ON|OFFDefault OFF

---

Date, time stamps for connects, disconnects.

ON - include date and time stamps in Connect and disconnect messages.

OFF - omit date and time stamps from Connect and disconnect messages.

Date and time stamps are useful when saving data in a file or in the QSO buffer for later viewing. The date and time is set using DAYtime and the format is determined by DAYUsa.

---

CONVersAn Immediate Command

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Takes you from the COMMAND MODE to the CONVERSE MODE, where whatever you type is sent as packets. The letter K is an alias for this command and allows single key entry to the CONVERSE MODE from COMMAND MODE.

---

CPactime ON|OFFDefault OFF

---

CONVERSE MODE packet timer.

- ON - use PACTime in CONVERSE MODE
- OFF - disable PACTime in CONVERSE MODE.

When CPactime is ON, the PACTime parameter is used in CONVERSE MODE as well as in TRANSPARENT MODE. This feature is typically used when NEAR-TRANSPARENT-MODE operation is desired. In this mode, characters are sent periodically, as in TRANSPARENT MODE, but the features of CONVERSE MODE are still available.

---

CR ON|OFFDefault ON

---

- ON - a <CR> is appended to all packets sent in the CONVERSE MODE.
- OFF - the send packet character is not appended.

In the CONVERSE MODE, with CR ON and SEndpac set to \$0D, each line will be sent as a packet with a <CR> at the end.

If the other station is getting overprinting of lines, use LFadd ON, or the other station can set AUtoLF ON.

---

CStatusAn Immediate Command

---

This shows the connect status of the ten possible links.

```
cmd:cs
  A stream -      Link state is: DISCONNECTED
  B stream -      Link state is: DISCONNECTED
  .....etc.....
  J stream -      Link state is: DISCONNECTED
```

---

CText Default blank

---

Connect text for CMSg

<text> - any text up to 120 characters

If parameter CMSg is ON, the CText message is automatically sent when another station connects to you in packet mode.

You may send multi-line text by using the PASs character (CTRL-V) immediately before the <CR>.

To clear the text without issuing a RESET command, use a % or & character as the first character.

---

DAytime yymmddhhmm Default nil

---

Allows the current date and time to be set in, yy years, mm month, dd day, hh hours and mm minutes. All groups must consist of two figures, including a leading zero.

Without a parameter the command returns the system time in dd-mm-yy hh:mm, with DAyUsa OFF and mm/dd/yy hh:mm with DAyUsa ON. The format for entering the system date and time is unaffected by the setting of DAyUsa.

```
cmd:da 8805070136
cmd:da
05/07/88 01:36:04
cmd:
```

```
cmd:dayusa off
DAYUSA was ON
cmd:da
07-05-88 01:36:20
cmd:
```

---

DAyUsa ON/OFf Default ON.

---

Determines the format for the date display.

ON - date is displayed as mm/dd/yy.  
OFF - date is displayed as dd-mm-yy.

The setting of this parameter does not affect the format required to set DAytime.

---

DElete ON! OFFDefault OFF

---

Sets the input line editing command for delete character.

- ON - the delete character is <DELETE> (\$7F).
- OFF - the delete character is <BACKSPACE> (\$08).

Only deletes to the beginning of the line, the onscreen indication is set by BKondel and a <CR> can be deleted using the PAss character. To see the corrected line, use the REdispla COMMAND.

---

DIGipeat ON! OFFDefault ON

---

This permits other stations to use your station as a repeater.

- ON - Allows your station to digi-peat.
- OFF - Disables the digi-peat function.

Any packets which your station receives that include your station together with its SSID in the repeater list, will be retransmitted.

---

DisconneAn Immediate Command

---

Initiates a disconnect sequence, if successful displays:

\*\*\* DISCONNECTED

If typed during a disconnect sequence, it will reset the retry counter and announce:

\*\*\* retry count exceeded  
\*\*\* DISCONNECTED

DISPlay A|C|H|I|L|M|T

## An Immediate Command

DISPlays all of the currently set TNC parameters or with a modifier, groups of parameters are displayed.

| Async        | Character     | Health      | Id             |
|--------------|---------------|-------------|----------------|
| cmd:disp a   | cmd:disp c    | cmd:disp h  | cmd:disp i     |
| 8BITCONV OFF | BKONDEL ON    | ASYRXOVR 0  | BEACON EVERY 0 |
| AUTOLF ON    | CANLINE \$18  | BBFAILED 0  | BTEXT          |
| AWLEN 7      | COMMAND \$03  | DIGISENT 0  | CBELL ON       |
| BBSMSGs OFF  | CANPAC \$19   | HEALLED OFF | CMSG OFF       |
| ECHO ON      | DELETE OFF    | HOVRERR 0   | CMSGDISC OFF   |
| ESCAPE OFF   | LCSTREAM ON   | HUNDRERR 0  | CTEXT          |
| FLOW ON      | PASS \$16     | RCVDFRMR 0  | HID OFF        |
| LCOK ON      | REDISPLA \$12 | RCVDIFRA 5  | MYCALL NOCALL  |
| NUCR OFF     | SENDPAC \$0D  | RCVDREJ 0   | MYALIAS        |
| NULF OFF     | START \$11    | RCVDSABM 0  | UNPROTO CQ     |
| NULLS 0      | STOP \$13     | RXCOUNT 17  |                |
| PARITY 3     | STREAMSW \$7C | RXERRORS 7  |                |
| RXBLOCK OFF  | STREAMCA OFF  | SENTFRMR 0  |                |
| SCREENLN 80  | STREAMDB OFF  | SENTIFRA 4  |                |
| TRFLOW OFF   | XOFF \$13     | SENTREJ 0   |                |
| TXFLOW OFF   | XON \$11      | TXCOUNT 16  |                |
| XFLOW ON     |               | TXQOVFLW 0  |                |
| TXTMO 0      |               |             |                |

| Line             | Monitor      | Timing           |
|------------------|--------------|------------------|
| cmd:disp 1       | cmd:disp m   | cmd:disp t       |
| AX25L2V2 ON      | BUDLIST OFF  | AXDELAY 30       |
| Link state is:   | CONSTAMP ON  | AXHANG 0         |
| DISCONNECTED     | DAYUSA OFF   | CHECK 30         |
| CONPERM OFF      | HEADERLN ON  | CLKADJ 0         |
| CR ON            | LCALLS       | CMDDTIME 1       |
| CONOK ON         | MONITOR ON   | CPACTIME OFF     |
| CONMODE CONVERSE | MALL ON      | DWAIT 38         |
| DIGIPEAT ON      | MCON ON      | FRACK 3          |
| FULLDUP OFF      | MFILTER \$00 | PACTIME AFTER 10 |
| LFADD OFF        | MRPT ON      | RESPTIME 0       |
| LFIGNORE OFF     | MSTAMP ON    | TXDELAY 25       |
| MAXFRAME 2       | MCOM ON      |                  |
| NEWMODE OFF      |              |                  |
| NOMODE OFF       |              |                  |
| PACLEN 80        |              |                  |
| PASSALL OFF      |              |                  |
| PORT 2           |              |                  |
| RETRY 10         |              |                  |
| SOFTDCD ON       |              |                  |
| TRIES 0          |              |                  |
| TRACE OFF        |              |                  |
| USERS 1          |              |                  |
| XMITOK ON        |              |                  |

---

DWait nDefault 16

---

Digipeat wait time delay.

n = 0 to 250, in units of 10 ms.

This value is used to avoid collisions with digipeated packets. The TNC will wait the specified time interval after last hearing data on the channel before transmitting. Some recommended values are:

|                    |      |
|--------------------|------|
| Individuals        | - 16 |
| BBS, mailbox, etc. | - 32 |
| User file transfer | - 48 |

This feature is made available to help alleviate the drastic reduction of throughput that occurs when digipeated packets suffer collisions. It is necessary because, currently, digipeated packets are not retried by the digipeater, but must be restarted by the originating station. Digipeaters do not wait DWait but transmit immediately. If all other stations operate with DWait, the digipeater will capture the frequency whenever it has data to send, improving network performance.

---

Echo ON|OFFDefault ON

---

Echo transmitted data on receive screen in CONVERSE MODE.

ON - In CONVERSE MODE, any transmit data sent from the computer to the TNC will be echoed on the receive screen.

OFF - This feature is disabled.

If your local typing is not displayed, then you should set Echo to ON. If the characters you type are displayed twice, you should set Echo OFF.

---

EScape ON|OFFDefault OFF

---

Specifies the handling of the <ESCAPE> character (\$1B).

ON - <ESCAPE> is output as "\$" (\$24).

OFF - <ESCAPE> is unchanged.

Some computers or programs may have a special use for the <ESCAPE> character.

---

Flow ON|OFFDefault ON

---

With type in flow control, entering a character at the keyboard suspends TNC output to the terminal, until certain conditions are met.

ON - Type in flow control is active.

OFF - Type in flow control is disabled.

This stops received data from interfering with data entry until, a packet is forced in CONVERSE MODE, a line is completed in COMMAND MODE, the packet length is exceeded or the terminal output buffer fills up.

Some bulletin programs need Flow off and some computers may be unable to receive and send data at the same time, set Flow OFF.

---

FRack nDefault 3

---

Frame retry interval

n = 1 to 15, representing units of 1 sec.

After transmitting a packet requiring acknowledgment, the TNC will wait the specified number of seconds before incrementing the retry counter and sending it again. If the REtry count specified by REtry is exceeded, the current operation is aborted. If the packet address includes digipeat requests, the time between retries will be adjusted using the following formula:

$$\text{Retry interval} = \text{FRack} * (2 * m + 1)$$

(where m is the number of relay stations)

When the retried packet is sent, a random wait time is added to any other wait times in use. This is to avoid lockups where two stations repeatedly collide with each other.

---

Fulldup ON|OFFDefault OFF

---

Full duplex mode disabled, allows the use of the carrier detect signal from the modem to hold off transmissions and avoid collisions and will acknowledge multiple packets with a single transmission.

- ON - Full duplex mode is enabled
- OFF - Full duplex mode is disabled

When Fulldup is ON, the TNC ignores the carrier-detect signal and acknowledges packets individually. Fulldup ON is useful for full-duplex radio operation, such as through a satellite.

---

Headerln ON|OFFDefault OFF

---

Sets how the address information is displayed.

- ON - Each header line is followed by a <CR> <LF>, then the packet text.
- OFF - This feature is disabled.

When monitoring packets, a header giving the origin and destination, and other information, may be displayed. If Headerln is ON each header will be followed by text on a new line. If Headerln is OFF, the text will appear on the same line as the header.

---

HEAlled ON|OFFDefault OFF

---

Allows the function of the CPU controlled, connect and status LED's to be changed

- ON - the LED's will dither.
- OFF - The LED's will be controlled normally.

If the TNC operation is normal, then the LED's dither in a seemingly random fashion. Should the software crash, then the LED's will probably not flash.



---

HID ON!OFFDefault OFF

---

HDLC identification, when digipeating.

- ON - Enables digipeater HDLC identification
- OFF - Disables digipeater HDLC identification

When HID is ON, the TNC will send an identification packet every 9.5 minutes if it's been digipeating packets. If HID is OFF, identification packets are not transmitted.

The identification packet comprises an unsequenced I frame with a data field containing your station ID with "/R" appended, the packet address is specified by Unproto.

---

IdAn Immediate Command

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Sends a special identification packet and is used to force a final identification packet, prior to a digi-peating station being taken off the air. It will only be sent if the station has digi-peated since the last automatic identification.

The identification packet comprises an unsequenced I frame with a data field containing your station ID with "/R" appended, the packet address is specified by Unproto.

---

KAn Immediate Command

---

Takes you from the COMMAND MODE to the conversation MODE, where whatever you type is sent as packets. The letter K is an alias for the CONVers COMMAND and allows single key entry to the conversation MODE from COMMAND MODE.

---

LCalls call1,call2....call8 Default Blank

---

Works in conjunction with BUdlist, to allow selective monitoring of packet stations.

call# - up to 8 stations together with SSID's

To monitor selected stations, enter the calls here and set BUdlist ON, and to ignore stations set BUdlist OFF. Useful for filtering out BBS's, while still monitoring the frequency.

---

LCok ON|OFFDefault ON

---

Enable/disable translation of case, for received data.

- ON - All received data displayed as is.
- OFF - All received data displayed in upper case.

This parameter has no effect on characters received in TRANSPARENT MODE. Characters you transmit are not case-translated. Therefore, you can use this to distinguish between incoming and outgoing data.

The other use for this command is if your terminal does not handle lower case, then you can translate all the data from the TNC to upper case.

---

LCStream ON|OFFDefault ON

---

Used to set the stream identifier to upper case.

- ON - The character immediately following the STREAMSWITCH character is translated to Upper Case.
- OFF - Processing is normal.

For multi-connect operation, an upper case stream identifier (A to J) must follow the STREAMSWITCH character (|), in order to select a new logical stream. This character MUST be in Upper Case.

---

LFadd ON|OFFDefault OFF

---

Similar to AU-elf and adds a <LINEFEED> to each packet, following the <CR>.

- ON - adds a line feed character to each packet.
- OFF - processing is normal.

Useful for stations with have terminals that overprint text, not normally needed.

---

LIFgnore ON!OFFDefault OFF

---

Filters out line feeds (\$OA) sent from the computer to the TNC, in COMMAND and CONVERSE MODES.

- ON - The TNC will ignore all line feeds it receives from the computer.
- OFF - This feature is disabled.

A useful command if you are receiving double spacing, due to the transmitting station. See also LFadd.

---

MAll ON!OFFDefault ON

---

Selects monitoring of unconnected packets only, or of both connected and unconnected packets.

- ON - monitors connected and unconnected packets.
- OFF - monitors only unconnected packets.

---

MAXframe nDefault 2

---

Maximum number of outstanding frames

n = 1 to 7

MAXframe is the maximum number of outstanding (unacknowledged) frames that the TNC is allowed to have at any one time; it is also the maximum number of contiguous frames the TNC may send in a single packet. If some, but not all, of the outstanding frames are acknowledged, a smaller number may be transmitted the next time, or new frames may be included in the retransmission, but the number of unacknowledged frames will never exceed MAXframe.

If you find that conditions result in frequent "retries", you may be able to improve performance by lowering this parameter. The maximum receive buffer space of the other station may be exceeded if you set too large an outgoing packet size. For file transfers, you may find that setting MAXframe to 7 and Paclen to 255 will give the best throughput on an empty VHF channel.

---

MCOM ON|OFFDefault ON

---

Enables the monitoring of connect, disconnect, and all other supervisory frames when Monitor is ON.

ON - all frames are monitored.

OFF - only information frames are monitored.

With MCOM OFF only packets with user information are shown, when ON all control fields are shown as well. Invalid frames are marked with ????

As with other commands, BUDlist and LCAlls determine the stations monitored.

---

MCon ON|OFFDefault OFF

---

The monitor mode can be enabled or disabled when you are connected.

ON - monitor is enabled when connected.

OFF - monitoring is disabled when connected.

---

MFilter n1,n2 etc.Default 00

---

Filters out selected characters from monitored data

n = two hex digits, up to four pairs may be entered.

You may choose up to four characters to filter out of the text of incoming packets before they are printed onscreen or in a buffer or file. For example, to filter out the bell character, type in ASCII value 07.

To filter out more than one character, type in the ASCII hexadecimal values of all the characters you wish to remove, up to 4 pairs, separated by commas.

For example, to filter out carriage returns (ASCII value 0D), line feeds (0A) and the bell character (07), type MF 0D,0A,07 the order in which you enter the characters isn't important.

You may wish to use this feature to filter out bell characters received from monitored stations. Since this command doesn't filter data from connected stations, you'll hear only those bells intended for you.

---

MHClearAn Immediate Command

---

Causes the Mheard list of stations to be cleared.

---

MheardAn Immediate Command

---

Displays a list of station heard by the TNC, since startup or the last MHClear. Stations heard via a digipeater are marked with \*. Up to 18 stations can be logged and earlier stations are aged out. If PASSall is ON then logging is disabled.

```
cmd: mh
VK3RPK      03-05-88  14:21:44
VK3CCT*     03-05-88  14:21:13
VK3RPA-1
```

In the above example, the clock was not set until after VK3RPA-1 was heard, VK3RPA-1 and VK3RPK were heard direct and VK3CCT was heard via a digipeater.

---

Monitor ON | OFFDefault ON

---

When ON and not in TRANSPARENT MODE, packets not addressed to your station are displayed.

ON - monitoring of packet activity is enabled.  
OFF - monitoring of packet activity is disabled.

Addresses are displayed along with the data portion. The Mall, Budlist and LCalls commands determine which packets are monitored. MCon controls the connected monitoring.

HEaderln determines the display, MRpt determines whether digipeater routing is shown, and MStamp will append a time if the clock has been set.

---

MRpt ON|OFFDefault ON

---

Monitor showing the repeater path.

- ON - Display digipeater paths for monitored packet.
- OFF - Display only the source and destination stations.

When MRpt is ON, digipeater paths of monitored packets are displayed and stations which have repeated the packet are marked with an asterisk (\*).

This will increase the line length and you may wish to set Headerln ON.

---

MStamp ON|OFFDefault OFF

---

Monitored packets are time stamped.

- ON - Time and date are displayed in monitored headers
- OFF - Time and date are not in monitored headers

This information will not be appended if the clock has not been set. You may wish to set Headerln ON, to clarify the display.

---

MY call nDefault NOCALL-0

---

Station callsign.

- call = callsign of your station
- n = 0 to 15, an optional sub-station id (SSID).

Call may be any combination of up to six letters or numbers. This call will be placed in the FROM address field of all packets originating from your TNC. The TNC will accept packets with MY in the TO field of the frames in the packet, and will relay frames with MY in the digipeat field. The default MY must be changed for proper operation, and there must not be more than one station with your MY (including SSID) on the air at any time. You may use different SSID numbers to distinguish between stations with the same amateur call. For example, VK3RPA-1 and VK3RPA-0 are both valid and different calls for packet stations. The extension -0 is not required.

---

MYAlias call n                      Default <blank>

---

An alias callsign for digipeater operation.

call = alternate identification.  
n = 0 to 15 (SSID).

MYAlias is an alternate callsign that your station will use (in addition to MYcall) when it is used as a digipeater. For example, if you set MYAlias to MELB and MYcall to your callsign, another station can digipeat through you using either name.

See MYcall for information on allowable strings.

---

NEwmode ON|OFF                      Default OFF

---

Selects how the TNC acts when connections are made and disconnected.

- ON - the data transfer mode is automatically selected on Connect and Disconnect.
- OFF - the data transfer mode is selected on connection and no return is made to COMMAND MODE on disconnect.

---

NOmode ON|OFF                      Default OFF

---

Determines whether the TNC will initiate a change of mode.

- ON - the TNC only switches modes when commanded.
- OFF - the TNC switches modes according to NEwmode.

---

NUcr ON|OFF                      Default OFF

---

Sends nulls (ASCII code \$00) to the terminal after <CR>.

- ON - null characters are sent to the terminal.
- OFF - null characters are not sent to the terminal.

This introduces a delay after <CR>, required by some hardcopy terminals. The number of nulls sent is determined by the NULLs COMMAND.

---

NULf ON|OFFDefault OFF

---

Sends nulls (ASCII code \$00) to the terminal after <LF>.

- ON - null characters are sent to the terminal.
- OFF - null characters are not sent to the terminal.

This introduces a delay after <LF>, required by some hardcopy terminals. The number of nulls sent is determined by the NULLs COMMAND.

---

NULLs nDefault 0

---

Specifies the number of nulls (ASCII code \$00) used by NUcr and NULf.

n = 0 to 30

---

Paclen nDefault 80

---

Maximum packet length

n = 0 to 255 (0 indicates a length of 256).

The TNC will automatically transmit a packet when the number of bytes input for a packet reaches Paclen. This value is used for both CONVERSE and TRANSPARENT MODES.

If you find that you are experiencing frequent retries, you may improve the likelihood of a packet being received without error by reducing Paclen, experimenting with MAXframe might help also.

Both TNC's do not have to be set to the same value, however some varieties of TNC are limited to 128 characters.



---

PACtime Every|After n                      Default 10

---

Packet timing for TRANSPARENT MODE

Every - packets are transmitted every n\*100ms  
After - packet timeout occurs after n\*100ms since the  
         last data was input  
         n = 0 to 250 in 100 ms intervals

This parameter is always used in TRANSPARENT MODE and may  
also be used in CONVERSE MODE if CPactime is ON.

---

PARity n                                      Default 3 (even)

---

Sets the parity mode for terminal or computer data transfer.

n = 0 no parity  
n = 1 odd parity  
n = 2 no parity  
n = 3 even parity

Any parity bit is automatically stripped on input and not  
checked in COMMAND and CONVERSE MODES. In TRANSPARENT MODE,  
all eight bits, including any parity, are transmitted in  
packets. With no parity set and AWlen 7, the eighth bit will  
be set to 0 in TRANSPARENT MODE.

---

PASs n                                      Default \$16 <CTRL-V>

---

Selects the "pass" input editing command.

n = 0 to \$7F (an ASCII character code)

This is the character you will type to include the following  
character in a packet or text string.

You may use this character to send any character in a packet,  
even though the character may have a special function for the  
TNC.

This command is particularly useful to insert a <CR> in BText  
and CText messages.

---

PASSAll ON|OFF

Default OFF

---

Pass all packets.

- ON - Disable error checking for received packets.
- OFF - enable error checking for received packets.

Normally, every time a packet is received, your TNC checks for bit errors using the FCS (CRC); only those packets passing this test are displayed on your screen. It is possible, however, to see packets that don't pass this test by setting parameter PASSAll ON. Because packets with errors are also displayed, you may notice strange characters on the screen. You can use this feature to test marginal paths.

MHeard logging of stations is disabled when PASSAll is ON, because received callsigns may be incorrect.

---

Port n

Default 2

---

Selects the modem baud rate.

- n = 1 Sets the modem for 300 Baud.
- n = 2 Sets the modem for 1200 Baud.

The usual HF baud rate is 300, and the VHF rate 1200.

---

REConnect call1 Via call#

An Immediate Command

---

Used to change the path through which you are currently connected. The integrity of outstanding frames is not assured.

---

REDispla n

Default \$12 &lt;CTRL-R&gt;

---

Used to change the terminal redisplay-line input editing character.

n = 0 to \$7F, an ASCII character code

This enables you to see a "clean" copy of your input if you are using a printing character.

Also useful for forcing the display of incoming messages before you send your packet.

---

RESET

An Immediate Command

---

Will RESET all parameters in the bbram to the EPROM defaults, destroying the user entered parameters, eg. MYcall and text.

To retain the user entered parameters, use RESTART.

---

RESptime n

Default 0

---

Acknowledge packet delay

n = 0 to 250, representing units of 100 ms.

This command sets a minimum delay that is imposed on acknowledgment packets. The delay may run concurrently with the default wait set by DWait.

RESptime is used to increase throughput during file transfers when you have usually set MAXframe and Paclen to larger numbers to maximize speed. If the TNC doesn't have a packet ready in time, transmission will stop temporarily. The acknowledgement from earlier frames will start, and the final packet of the series may be sent and will collide with it. If the receiving station sets RESptime to a longer value, say 10, its acknowledge will be held off to prevent this problem.

---

RESTART

An Immediate Command

---

This restarts the TNC with the defaults stored in bbram, the same as turning power ON and OFF. To reset bbram to the default EPROM parameters, use the RESET COMMAND.

---

REtry nDefault 10

---

REtry count

n = 0 to 15

REtry determines the number of times the TNC will attempt to send an unacknowledged frame before timing out and disconnecting your station. It also specifies the number of times it will send a connect (SABM) frame to connect to a station for you. If a REtry count of 0 is specified, the TNC will try continuously until you initiate a disconnect yourself. If REtry is exceeded, a message is displayed showing that you exceeded RETRY and were disconnected.

A high REtry count may be needed if there is a lot of activity on your frequency. If you find that the REtry count is being exceeded and you are disconnected often, consider changes to MAXframe and/or PacLen. It may also be possible to make your connection through an alternate path using one or more digipeaters.

---

RXblock ON/OFFDefault OFF

---

Used for automated operations, some bulletin board programs, to discriminate between data received from the connected station and TNC generated messages.

ON - TNC sends data in RXblock format.  
OFF - standard format is used.

For correct operation of RXblock, AWlen should be set to 8(bits) since the character \$FF marks the beginning of a received data unit header.

With RXblock ON data is sent to the TNC in the format:

|  |          |  |            |  |    |  |         |  |         |  |
|--|----------|--|------------|--|----|--|---------|--|---------|--|
|  | \$FF     |  | LO         |  | L1 |  | PID     |  | DATA    |  |
|  | (Prefix) |  | ( Length ) |  |    |  | ( Pid ) |  | (Data ) |  |

|        |      |  |
|--------|------|--|
| Prefix | \$FF | - A character with all 8 bits set.                                     |
| Length | LO   | - The high order data length, and pid fields logically Ored with \$F0. |
|        | L1   | - Low order data length and pid fields                                 |
| Pid    | PID  | - The protocol identifier byte from the following data field.          |
| Data   | DATA | - [Optional], variable length data.                                    |

For best operation AUtoIf, Mfilter etc. should be set OFF, to prevent uncertainties in the data field size.

---

Screenln n                      Default 80

---

Used to format the terminal output. A <CR> <LF> sequence is sent after n characters.

n = 0 to 255 the number of characters to a line.

If your computer automatically formats output lines, you should set Screenln to 0 to avoid conflicts.

---

SEndpac n                      Default \$0D

---

Selects the character which will force a packet in the CONVERSE MODE.

n = 0 to \$7F, an ASCII character

For ordinary CONVERSE MODE, SEndpac \$0D and CR ON, will cause packets to be set at natural intervals and causes a <CR> to be included in the packet.

With CPactime ON, you will probably set SEndpac to some character not ordinarily used (say <CTRL-A>) and CR OFF. This forces packets to be sent, but will not result in extra <CR> characters being transmitted.

---

STArt n                      Default \$11 <CTRL-Q>

---

Selects the user restart character sent from the terminal, to indicate to the TNC to resume sending.

n = 0 to \$7F, an ASCII character.

If the STArt and STOp commands are set to \$00, software flow control to the TNC is disabled, and the TNC only responds to hardware control via CTS.

STOP n

Default \$13 <CTRL-S>

Selects the user stop character sent from the terminal, to indicate to the TNC to cease sending.

n = .0 to \$7F, an ASCII character.

If the STArt and STOp commands are set to \$00, software flow control to the TNC is disabled, and the TNC only responds to hardware control via CTS.

STREAMCa   ON | OFF

Default OFF

Enables display of the connected station callsign after the stream identifier.

ON - callsign of the other station displayed.  
OFF - callsign not displayed.

Useful when operating with multiple connections and is similar to the MRpt COMMAND.

|                        |                |
|------------------------|----------------|
| STREAMCALL ON          | STREAMCALL OFF |
| A:VK3RPA:hi Bill       | Ahi Bill       |
| B:VK3RPA:*** CONNECTED | B*** CONNECTED |

STREAMDb1 ON;OFF

Default OFF

Will emphasise the STReamsw characters, by doubling them.

ON - double all STreamsw characters.  
OFF - leave STreamsw characters as received.

With STREAMDb1 ON and STReamsw set to 1, you will receive an incoming display of:

|| this is a test

When the transmitting station sent:

| this is a test

Useful for differentiating between characters from other stations and those generated internally by you TNC.

The STreamsw character cannot be one of the letters A to J for this command to function properly.

See also the STREAMDb1 and STREAMCa commands.

TRACE ON/Off                      Default OFF

This enables protocol debugging.

ON - TRACE is enabled.  
OFF - TRACE is disabled.

When ON, all received frames are completely displayed, including header information. This will only be required if you suspect a software bug. A trace of information is used to investigate these bugs.

|              |                      |
|--------------|----------------------|
| <u>Trans</u> | An Immediate Command |
|--------------|----------------------|

Causes the TNC to enter the TRANSPARENT MODE without affecting the current link state. Used for file transfers.

TRFlow ON|OFF                      Default OFF

If ON the settings of STArt and STOp will determine the flow control for TRANSPARENT MODE.

ON - software flow control can be enabled.  
OFF - software flow control is disabled.

If TRFlow is ON and STArt and STOp are non-zero, the software flow control is enabled.

---

|                 |           |
|-----------------|-----------|
| <u>TR</u> ies n | Default 0 |
|-----------------|-----------|

---

Used to retrieve (or force) the count of TRies on the selected input stream.

n = 0 to 15 retry level on the selected input stream

Without argument, the TNC will return the current number of retries for any outstanding packet. With no outstanding packet, then it returns the value of the counter for the previous packet.

Useful for obtaining performance of a path etc.

---

|                   |            |
|-------------------|------------|
| <u>TX</u> delay n | Default 30 |
|-------------------|------------|

---

Transmitter delay

n = 0 to 120, representing units of 10 ms.

TXdelay tells the TNC how long after PTT to send flag characters before switching to data. Flag characters may be recognized on the air as a uniform buzz at the beginning of the packet. Different transmitters require different amounts of start time to turn on and stabilize. In general, crystal rigs with diode antenna switching need only a little time, synthesized rigs need time for PLL lockup, and rigs with mechanical relays need even more. The correct value for your equipment should be determined by experimentation. To increase throughput, TXdelay should be set as low as possible, but still allow for consistent flow of data. If another station is having trouble receiving you, set TXdelay to 120 temporarily to rule out a short setting as the problem.

Earlier TNC's (TAPR 1) interpret this interval in 40ms intervals, therefore multiply old settings by 4.



---

TXFlow ON|OFFDefault OFF

---

If ON the setting of Xflow determines the flow control used in the TRANSPARENT MODE. With TXFlow OFF only hardware control is used and all data to the terminal is fully TRANSPARENT.

ON - software control can be enabled in TRANSPARENT  
OFF - software control is disabled in TRANSPARENT

With TXFlow and Xflow ON, the TNC uses the XON and XOff characters to determine the control of input from the terminal. Unless TRFlow is also ON, only hardware flow is available to control TNC output to the terminal.

---

Unproto call etc.Default CQ

---

Unprotocol transmission path.

call etc. - Call list specifying a packet path.

It is sometimes useful to be able to send packets even if you are not connected to another station. Sending packets in this way is like making a voice broadcast. Unproto packets are sent as unsequenced I frames. The TO and DIGIPEAT fields of the frame may be specified.

Unproto is handy for round-table type QSO's.

It is possible to route Unproto packets through one or more digipeaters for wider area coverage. Some examples of Unproto paths are:

CQ VIA VK3RPL

QST VIA VK3RPL,VK3RPW

---

USers nDefault 1

---

Number of multiconnects allowed.

n = 1 to 10

Stations requesting to connect to you may do so, until the number of stations connected equals the value set.

---

Xflow ON|OFF                      Default ON

---

Allows the TNC to stop and restart communications with the terminal, via the RTS line, and the characters set by XON and Xoff.

ON - XON/XOFF flow control enabled.  
OFF - XON/XOFF flow control disabled.

---

XMitok ON|OFF                      Default ON

---

The PTT line is disabled.

ON - PTT functions are enabled.  
OFF - PTT functions disabled.

Mainly used for ensuring that TNC does not transmit, and may also be used for testing.

---

Xoff n                                  Default \$13 <CTRL-S>

---

Selects the TNC flow control stop character used by Xflow.

n = 0 to \$7F, an ASCII character.

---

XON n                                  Default \$11 <CTRL-Q>

---

Selects the TNC flow control restart character for Xflow.

n = 0 to \$7F, an ASCII character.

EPROM DEFAULT PARAMETERSSIGN-ON MESSAGE

Pac-Comm Packet Radio Systems TNC-220  
 AX.25 Level 2 Version 2.0  
 Release 1.1.5 11/13/87 - 32K RAM  
 Checksum \$A6

|                  |                  |               |
|------------------|------------------|---------------|
| 8BITCONV OFF     | FLOW ON          | RCVDIFRA 0    |
| AX25L2V2 ON      | FRACK 3          | RCVDREJ 0     |
| ASYRXOVR 0       | FULLDUP OFF      | RCVDSABM 0    |
| AUTOLF ON        | HEADERLN OFF     | RETRY 10      |
| AWLEN 7          | HEALLED OFF      | REDISPLA \$12 |
| AXDELAY 0        | HID OFF          | RESPTIME 0    |
| AXHANG 0         | HOVRERR 0        | RXBLOCK OFF   |
| BEACON EVERY 0   | HUNDRERR 0       | RXCOUNT 0     |
| BBFAILED 0       | LCOK ON          | RXERRORS 0    |
| BBSMSGs OFF      | LFADD OFF        | SCREENLN 80   |
| BKONDEL ON       | LFIGNORE OFF     | SENDPAC \$0D  |
| BTEXT            | LCALLS           | SENTFRMR 0    |
| BUDLIST OFF      | LCSTREAM ON      | SENTIFRA 0    |
| CBELL OFF        | MONITOR ON       | SENTREJ 0     |
| CONPERM OFF      | MALL ON          | SOFTDCD ON    |
| CHECK 30         | MCON OFF         | START \$11    |
| CLKADJ 0         | MFILTER \$00     | STOP \$13     |
| CMDTIME 1        | MRPT ON          | STREAMSW \$7C |
| CMSG OFF         | MSTAMP OFF       | STREAMCA OFF  |
| CMSGDISC OFF     | MYCALL NOCALL    | STREAMDB OFF  |
| CPACTIME OFF     | MYALIAS          | TRFLOW OFF    |
| CR ON            | MAXFRAME 2       | TRIES 0       |
| CTEXT            | MCOM ON          | TRACE OFF     |
| CANLINE \$18     | NEWMODE OFF      | TXCOUNT 0     |
| COMMAND \$03     | NOMODE OFF       | TXDELAY 25    |
| CANPAC \$19      | NUCR OFF         | TXFLOW OFF    |
| CONOK ON         | NULF OFF         | TXQOVFLW 0    |
| CONMODE CONVERSE | NULLS 0          | TXTMO 0       |
| CONSTAMP OFF     | PACLEN 80        | UNPROTO CQ    |
| DAYUSA ON        | PARITY 3         | USERS 10      |
| DELETE OFF       | PASS \$16        | XFLOW ON      |
| DWAIT 16         | PASSALL OFF      | XMITOK ON     |
| DIGIPEAT ON      | PACTIME AFTER 10 | XOFF \$13     |
| DIGISENT 0       | PORT 2           | XON \$11      |
| ECHO ON          | RCVDFRMR 0       |               |

GENERAL OPERATING NOTES

These notes are spartan at present, but are destined to grow, as time and user input permits. Please feel free to send in hints and operating notes, which we may publish for the benefit of all. We would be very interested in specific hardware connections for computer/TNC and radio connections as well as any hints on operating software. You can mail them to MPRG, or send them as a bulletin on a PBBS to ALL@VK, we will then pick them up and compile them for publishing.

The major source of information, used so far, is the TAPR documentation, from which much of the software manual has been derived. We gratefully acknowledge TAPR for their work and the release of this information to Amateur Organisations like ours.

Thank you for your patience in waiting for this documentation, we realise it has warts and will make every effort to improve it.

DIGIPEATER OPERATIONS

Unlike voice FM, Packet does not need a separate set of repeaters dedicated to the task of relaying your messages. Because packet is digital and structured information, it can be stored by a computer and then re-transmitted, perhaps even on another frequency or radio. This computer can be a simple TNC, or a computer emulation of the AX25 protocol which implements digipeating, or it could be a more complex protocol, such as TCP/IP.

The Shepparton TNC 220+ is fully capable of digipeating and this operation can be carried out without interfering with the digi-peating stations normal operations (see the instruction DIGipeat). If you set DIG ON (the default) then your station will re-transmit any received packets that have your callsign and SSID in the repeat section of the packet addressing information.

No special identification is required, to comply with the current regulations, because the AX25 protocol will cause a bit to be set on the re-transmitted packet indicating that it has been digi-peated by your station. The Shepparton TNC 220+ complies with this specification.

Similarly, the regulations permit you to operate Packet in an unattended mode, providing you have an external watch dog timer that will disable the PTT line and return the transceiver to receive, if it is keyed for too long. The Shepparton TNC 220+ meets this requirement and will disable the PTT line if it is keyed for more than about half a minute. This timer must be separate to the timing done in the computer software.

If you are in the connected mode, then the only indication that digipeating is occurring is the flashing of the DCD Led and then the PTT Led, when you have no outstanding opackets. You should notice no real interference to your own operations.

That covers your participation as a digi-peater, but how do you use other AX25 stations to digipeat for your packets? Simple, when you give an address in a connect request, you add a route after the callsign that you want to connect to.

eg. cmd:Connect VK3RPA Via VK3RPS

You may have up to eight callsigns after the via, and these other stations are in the order that you may have to digi-peat through to follow a path to the desired connection.

In theory, this gives you an incredible power to cover a large number of hops, but the limitations of passing the packet in AX25 become obvious as channel usage rises. The cause of most problems is that the originating station must receive a receipt for its sent packets from the connected to station, or after a time it will retry, or send the packet again. Intermediate digi-peaters only do a check that the packet is valid and re-transmit it, they do not hold it and get a receipt from the next station in the chain. Therefore, if there are queries about missing packets, these must be resolved at either end of the chain and messages relating to this house-keeping, must also travel the length of the chain.

In some areas, dedicated digi-peaters have been established at high sites to provide greater coverage or to extend the VHF range. At the moment these are not particularly smart devices and merely echo the AX25 protocol used on a TNC, like the TNC 220+.

#### PACKET BULLETIN BOARD OPERATION

This is one of the most exciting aspects of Packet Radio and has the potential to provide a reliable broadcast and message system, that is available when the user is. Attached is a copy of an operating guide for the WA7MBL Bulletin Board System. This is fairly raw and biased to American conditions, when time permits we will release a more locally oriented version, but it is hoped you will gain some use from it.

USER GUIDE  
for  
The WA7MBL Packet Bulletin Board System

This guide is provided with the compliments of the Rocky Mountain Packet Radio Association - May 1987. It was prepared by Steve Linn, N4CAK with input and review by Bob Gobrick, WA6ERB

Together with the commands needed to operate your Packet TNC, most PBBS's (or mailbox's) have a number of additional user commands. This guide provides a quick overview of the WA7MBL Version 3.13 PBBS system, and is intended to assist you in its efficient use.

The PBBS software was written by Jeff Jacobsen, WA7MBL, of Logan, Utah (a RMPRA member). Much of the format is styled after the PBBS software work pioneered by Hank Oredson, WORLI.

What does the PBBS Do

The PBBS provides the following resources and functions:

- > Personal mail identified by call can be sent and received
- > General files, programs, documentation, maps, etc.
- > Frequency activity monitored (stations heard)
- > Automatic forwarding of bulletins to other PBBS's
- > Automatic forwarding of mail via HF PBBS Gateway station

How do you log on?

You begin a PBBS session by simply connecting with the station running the PBBS. Sometimes, however, the response coming back will indicate the PBBS is busy. When the PBBS is available again, it will transmit its beacon. You may now attempt to connect again. The PBBS automatically records your call from the connect message and knows who you are from then on. You then get a greeting message and a prompt line.

Commands are one or two letters. Some commands are followed by a message number, call or file name. For these commands, you must leave a space between the command and the message number, call or file name. During your connection to a PBBS, you send a series of commands to perform the functions you desire and at the end you send a B (bye command) to disconnect from the PBBS. I'll explain what the commands are as we go on. At the end of this guide you will find a consolidated list of commands. If you feel a need to rush in before reading all of this, PLEASE send your commands only once. If you don't see any response, wait, do not send the command again. I'll explain later.

The first time on you'll probably see "Please use N command to enter your name" followed by "Type H (return) for help". So type N Steve <cr> (assume for the rest of this guide that you hit a return after each command) and the system comes back with Hello Steve or something similar. Now the PBBS and the SysOp (System Operator - that generous person who has contributed his equipment and time to make this PBBS available) know who you are.

Before we go too far, you need to know how data is stored on the PBBS. There are two main formats for data which you can access. These are not interchangeable and you must make sure that you are using the correct commands for the type of data.

#### Mail Messages:

Most of your interaction will probably be with the mailsystem and mail messages. Mail messages are to and from specific users or to generic users like ALL.

#### Data Files:

This is the other format of storage and can contain any kind of data. These files generally contain larger amounts of data such as newsletters, programs, maps, etc. Data files are always named with 1 to 8 characters, a period and 0 to 3 more characters. Examples are USER.DOC, COLORADO.MAP, etc. Using the same suffix (i.e. .MAP) allows grouping of files of similar type.

Now that you are rolling, let's see what other commands are available and what you can do.

### HELP-TYPE COMMANDS

These commands give the user information about the system and how to use it.

Command: H or ?

#### HELP

Gives general HELP with all system commands. It isn't context sensitive - it always gives the same answer regardless of where you are in the system. This shouldn't be necessary if you have this guide.

Command: ?[Letter]

Detailed HELP with individual system commands. For example, type "?U" for HELP with uploading. The descriptions in this guide are similar to what you would get with this command.

Command: I

#### INFORMATION

Details about this particular PBBS - equipment, stations served, SYSOP.

### MESSAGE-TYPE COMMANDS

These commands are used to read and send personal messages to other users. All messages are referred to in every command by number, and you find out what the number of each message is by using the LIST command. You will not see any of the message text. The READ command is for looking at the message text. The highest current message number and the number of outstanding messages are shown in the prompt line when you log in as well as in the beacon text, so you should have some idea of what the active messages are. The first time you log into a PBBS, you may wish to list all messages. PLEASE don't list all messages each time. It takes a long time and ties up the frequency needlessly.

There are several variations of the list command. Each is explained below, but first let's look at a sample message list and explain what all the information means. Here's a sample message list:

| Msg# | TS | Size  | TO     | @ BBS | From   | Date   | Subject             |
|------|----|-------|--------|-------|--------|--------|---------------------|
| 5059 | Y  | 102   | N4CAK  |       | WA6ERB | 05-May | Tnx for User Manual |
| 5054 | BN | 15659 | ALL    | MAP   | KC0RL  | 05-May | Colorado.Map 5/1/87 |
| 5053 | BN | 723   | ALLCO  |       | KA0MQA | 05-May | Swapfests           |
| 5052 | TN | 1172  | NTSCO  |       | W1HAB  | 05-May | Traffic for NOIA    |
| 5051 | N  | 126   | KOVLD  | KOVLD | WOHJX  | 04-May | Dual port BBS       |
| 5050 | PY | 243   | WA6ERB |       | KE6LT  | 04-May | 450 Link            |

**Msg#** This is the message number. You will use this number in other commands such as read or kill. You designate which message you wish to read by specifying its number in the read command.

**T (Type)** The message type designation. This allows categorization of messages. B indicates a bulletin message, T an NTS Traffic message and P a private message (private messages can only be listed or read by the sender, recipient and SYSOP).

**S (Status)** This column contains Y or N depending on if the recipient has read the message (it is not changed if someone OTHER than the intended recipient has read it). If N, the message has not been read and the recipient call still appears in the beacon text. The column also can have an F or \$ to signify a message or bulletin that has been forwarded as part of the automatic PBBS forwarding system.

**Size** This column tells you how big the message is in bytes. On longer messages, you might want to capture the message to disk as it comes into your computer so you can read it later. You can abort a listing by typing the letter A<cr> if it is too long.

**TO** This is the intended recipient of the message. It is specified by the user sending the message. It's generally a callsign or ALL. A name like ALLCO, or something like that, is used to specify mail to be forwarded to all users at one or more other PBBS's. We will discuss message forwarding later.



@ BBS            This column indicates another PBBS that this message is to be forwarded to.

From            This column is set automatically to the call of the station sending the message.

Date            This is the date that the message was posted at this PBBS. It may not be the same date that the sender sent it if it was forwarded to the PBBS from another PBBS.

Subject        A description of what the message is about. It may also contain "Forwarded from ..." for messages from another PBBS. It is set initially by the originating station and can be changed by the SYSOP.

#### LIST COMMANDS

Command: L            LIST new messages  
List any new messages that have been posted to the PBBS since the last time you used the L command.

Command: LM           LIST MINE  
List only messages to you.

Command: LN           LIST NEW  
List only unread messages to you.

Command: LL x        LIST LAST  
List the most recent number of messages specified by x. LL 10 will list the last 10 messages.

Command: L x        LIST From #  
List only messages above number x. L 325 list messages above #325.

Command: L x y      LIST From # to #  
List a group of messages. L 300 325, list messages from #300 to #325.

Command: La        LIST TYPE  
List messages of type 'a'. LB lists bulletins, LP lists private messages (although you will only see those sent by you or to you), LT lists NTS traffic messages (mainly used by NTS traffic handlers), etc. You can also do a La x or La x y.

Command: L> call    LIST TO  
List all messages sent to the specified call sign. L> NOCCZ lists all messages currently in the PBBS that were posted for NOCCZ. Entering L> your-call is the same as entering LM.

Command: L< call      LIST FROM  
List all messages sent by the specified call sign. L< WOHJX will list all messages currently in the PBBS posted by WOHJX.

#### READ COMMANDS

Command: R x            READ  
Read message #x (not "files"). You may have up to 6 messages numbers per line. R 325 327 340 would list these three messages.

Command: RM            READ MINE  
Read all messages addressed to you.

Command: RN            READ NEW  
Read all new messages addressed to you.

In version 3.13, messages read with the R command have any standard forwarding headers stripped off. This routing information is normally not needed by the user. To read the entire message text, you may use the V (VERBOSE) versions of the above R commands.

Command: V x            VERBOSE READ  
Read message #x. You may also have up to 6 messages numbers per line. V 325 327 340 would list these three messages.

#### KILL COMMANDS

Command: K x            KILL NUMBER  
Kill a specific message. Only the sender, recipient or SYSOP can kill a message. You may have up to 6 messages numbers per line

Command: KM            KILL MINE  
Kill all messages sent to you that you have read. This will not kill messages sent to you that you have not read. Please kill your messages that no longer need to be on the PBBS.

#### END COMMANDS

Command: S call        SEND CALLSIGN  
Sends an open message to 'callsign'. Others can read this message. You can not send S alone - you need a callsign.

Command: SP call       SEND PRIVATE  
Send a personal message to 'callsign'. Others cannot read this message, although the 'callsign' will appear on the beacon. Preferred to cut down on long L listings by others.

Command: S call @ SEND VIA  
Send a message to a station at another PBBS by automatic mail forwarding. SP N4CAK @ WA6ERB would send a private message to N4CAK at WA6ERB's PBBS. Forwarding via HF is covered later. Typically, once a message is forwarded, the originating PBBS will automatically delete it.

Command: SB ALL SEND BULLETIN  
Send a general bulletin addressed to ALL.

Command: ST NTSxx SEND TRAFFIC  
Send NTS traffic with xx as the state abbreviation. ST NTSNY would send NTS traffic for NY. Your subject column should contain additional NTS information about recipient - callsign, city, state, etc.

After you've told the PBBS who the message is to, the PBBS will then ask you to supply a title for the message. This entry will show up in the message list in the Subject column. Please be brief.

You will then be asked to enter your message. When finished, you terminate text entry by sending a control-Z. (Some user computers are unable to send a control-Z. In this case, you may place the command /EX on a separate last line).

If you are going to be entering a rather long message, it's a good (excellent) idea to compose the message off line with a word processor or even a simple text editor. Then connect to the PBBS, execute the send command, enter the title and then send the precomposed message text to the PBBS. You could even include the send command and message title in the precomposed message as the first and second lines of the message. Add /EX as the last line of the message and you can completely automate your message entry.

#### FILE-TYPE COMMANDS

The following commands deal with data files, which generally contain text material (AMSAT Bulletins, RMPRA NEWS, area user maps, etc.) or program files.

Command: W WHAT files  
List of all the data files available on the PBBS. Recall that data file names are of the format xxxxxxxx.yyy. You may use wildcards, such as W \*.DOC will list all files with the extension of DOC (Documentation).

In the file list, you may also see file names followed by the designation <DIR>. This indicates a file subdirectory, which will contain a number of additional files. Usually files that are related will be placed in a subdirectory. All AMSAT Bulletins might be placed in a subdirectory named AMSAT. To list the contents of a subdirectory enter the W command followed by the subdirectory name. W AMSAT will list all files in the AMSAT subdirectory. Many subdirectories will have a "README" file which may give you information about the files in that subdirectory.

Command: WN                    WHAT NEW  
List of new files since you last logged on.

Command: D file                DOWNLOAD  
Transmits a file from the PBBS to you. The D is followed by a filename you want to download, such as D USER.DOC. You generally want to have the capture buffer on your computer open to receive the incoming file.

If the file you are downloading is in a subdirectory, you precede the file name with the subdirectory and a slash, such as D MAP/COLORADO.MAP if COLORADO.MAP was in the MAP subdirectory.

Command: D file x              Partial Download  
If 'x' is 10, you would see first 10 lines.  
If 'x' is -20, you would skip the first 20 lines. If 'x' is 5 15 you would see lines 5 to 15. This is valuable if you want to 'preview' a file before you download it.

Command: U file                UPLOAD  
Send a file from you to the PBBS (opposite of the D Command). The file naming convention is the same for uploading as it is for downloading, including the subdirectory name if any. Terminate the upload by sending a control-Z. As an example, to upload the Denver ham exam schedule, type U EXAMSCH/DENVER.SCH.

One danger in uploading to the PBBS is that you could use up all of the remaining space on the system. This can crash the system since the mail, user and log files need room to expand. ALWAYS check to see how much space is left on the disk with the W command before you upload something. Don't push the storage.

You may be looking for a command to kill a file, similar to the K command which removes a message. Sorry, there's nothing like that. Only the SYSOP can do that from the console - leave a message to him making the request.

OTHER COMMANDS

Command: A           ABORT  
Abort a listing, either mail or files. A fair amount of the message or file may be buffered in the PBBS's TNC, so the abort is not instant, but it will work. Always try a partial download (ie. D MAP/WYOMING.MAP 10) first to see if the file is what you want and if not, hit the A <CR>.

Command: B           BYE  
Log off the PBBS (gracefully) and disconnects your call. You will be logged off automatically if there is no response to a menu in 4 minutes due to inactivity or path timeout.

Command: J           Calls Heard  
List of calls heard by up to 6 TNC's, the channel or service assigned to each TNC, and the stations that have been connected to this PBBS.

Command: JK          Calls of users that have connected to the PBBS.

Command: Ja          Calls heard - on TNC 'a'. Type A, B, C, D, E or F for up to 6 TNCs.

Command: N name      NAME  
Enter or change your name in the database. You can use up to 12 characters. Phony names will be canceled.

Command: T           TALK  
Pages the SYSOP. If the SYSOP is available to chat, you'll get a response within ONE MINUTE. Otherwise, the PBBS will advise you that SYSOP hasn't answered. You'll be returned to the command prompt and can continue normally. You may leave a message with the SYSOP if the SYSOP is not available.

Command: V           VERSION  
Shows specific version of this PBBS, the date of the software release, number of active messages and the next message number.

Command: X           EXPERT  
You can change your status to expert. This will give you a shorter menu prompt, no Welcome message when you log on, and no Goodbye message when you log off.

Command: Y           YAPP  
Binary transfer programs. Currently, the YAPP program is available ONLY for IBM-PCs and compatible MS-DOS computers. Type Y or ?Y for the HELP listing on YAPP - it's almost two pages long.

### FORWARDING

Automatic forwarding of messages to other PBBS's adds a new dimension to packet message handling. It allows mail to be passed between PBBS's automatically, according to a pre-defined list. The forwarding can occur in off-hours to minimise traffic on the frequency or can occur on a different frequency.

Each mailbox has the capability to maintain a list of all stations and their "home" PBBS. When not connected to another user, the PBBS checks the mail file each hour for stations with mail on the forwarding list. If there is mail to any user on the forwarding list and it is the proper time to forward to that station, the PBBS goes off line, connects with the other PBBS and sends the mail. If the connect is not successful or the other PBBS is busy, the mail is not forwarded and waits until the next forwarding time (generally an hour later).

Each PBBS in the link is assigned a forwarding time - a certain number of minutes after the hour. These are coordinated to prevent 2 stations from trying to forward to each other at the same time. When not inhibited, forwarding occurs at the same time each hour for a given station. Start and stop times can also be specified for each forwarding time to each destination. This allows inhibiting forwarding during busy peak times.

You don't have to do anything special to use forwarding. The SYSOP is responsible for getting the forwarding files set up. All you do is send the message. Mail sent to a user served by another PBBS will automatically be forwarded if that user is in the forward file or you assign an @ BBS. Typically, all mailboxes in a given area will have entries in their forwarding files for all other PBBS's in the area, perhaps even for the entire country. So if you know that N4CAK reads his mail on the WA6ERB PBBS, all you need to do when you send your message to N4CAK is enter S N4CAK @ WA6ERB. Your PBBS will then forward it on to WA6ERB where N4CAK will see it.

However, HF forwarding is a little different, at least for now. If you would like to send non-NTS HF traffic (by a 20 meter HF Gateway) from the Colorado area as an example, you need to do the following:

1. Address mail to the packet station that will receive it in the TO column (packet equipped station only for now).
2. In the forward column (@), put either W1HAB (Boulder), KOHOA (Colorado Springs), KCOQJ (Walsenberg) or KN50 (New Mexico). These are the packet HF Gateway Bulletin Boards for the Rocky Mountains and are the only stations that will forward HF traffic at this time.
3. In the Subject column put the following info: HF Traffic to City, ST - W1xxx BBS. This tells the Gateway station that it is HF traffic to a certain city and state and if you know the local BBS in the recipients area.

If you have a HF BBS question, leave a message for the HF Gateway BBS Sysop by way of your local PBBS.

NTS traffic forwarding is similar and your NTS packet coordinator can assist you in the proper use.

If you travel and operate packet at other PBBS's, you might want to add an SSID number to your call, such as KOGUZ-1. Then when the PBBS's share forwarding files, only one (your HOME) PBBS will have your plain call sign (such as KOGUZ), and mail sent to you will be forwarded to only one PBBS and not numerous ones.

Not every PBBS is set up to forward to every packet user. The only way a SYSOP will know what your home PBBS is if you tell him. It might be a good idea to send a message to your home PBBS SYSOP and ask him to inform the other PBBS's of your "home" status. That way, if someone posts a message to you on a PBBS across town and doesn't specify your home PBBS when sending the message, the PBBS itself will have a record in its forwarding file of your call sign and what your home PBBS is. That PBBS will then automatically forward the message on to you at your home PBBS.

There are certain "ALL" destinations that are used to send mail to all users at a remote PBBS. For example, ALLNCO will distribute a message to all northern Colorado PBBS's, as ALLSCO will do for southern Colorado. What "ALL" designations are available and where the messages so addressed will go is determined solely by the SYSOPs of the various PBBS's. You might leave a message for the SYSOP of your home board asking for a copy of his forward file. This will tell you everything you need to know about what goes where.

For Bulletins needing wide distribution, a "flood" system has been designed. You need only Send the Bulletin to ALL (SB ALL), then send a second message to your SYSOP asking that message number 'x' be distributed to whatever area you want. The SYSOP will then set up a flood for that message for you. This is preferable (and faster) to you sending multiple bulletins @ different PBBS's.

#### Good Operating Ideas from a Sysop's Viewpoint

The following ideas come from many hours watching the SYSOP's screen and seeing difficulties that users have had.

Do not send commands more than once. New users to the PBBS will occasionally send a command, wait for a response, and seeing nothing will become impatient and send the command again. This is unnecessary because in packet radio, either the packet will get through to the other station or you'll "retry out". If you're still connected, the packet will get through. If you send the command twice, the PBBS will respond twice.

Repeatedly executing the information or help functions is unnecessary. The H or ? (HELP) command prints a summary list of commands. The I (Information) command gives information on the particular PBBS installation. They aren't context sensitive and their responses won't vary depending on what you're doing in the PBBS. The information is always the same. Therefore, there's no need to print it more than once, but remember to print it once.

If possible, stack multiple commands using the PASS character (usually control-V). With a TAPR TNC or clone, each time you hit return, you send a packet. You have to end a command to the PBBS with a return so you have to send it. You can save air time, though, by "stacking" commands in the same packet by preceding the return with the PASS character. This will put all the commands in the same packet. Of course, don't use the PASS character before the last return or you'll never send the packet at all!

Don't list all messages. The message file gets pretty long pretty fast and listing the whole file takes a long time. Along these lines, please be courteous during peak usage hours - limit your access time so others may pick up their mail.

Finally, please recognize two things. First, it takes a good deal of time to properly run a PBBS, so be patient with occasional problems which may occur. Disks have to be backed up, files moved around, old messages deleted, and new versions of the program have to be loaded.

ENJOY!



Rocky Mountain Packet Radio AssociationCommand Summary for MBL313 PBBS

A - ABORT a listing  
B - BYE, logs off PBBS and disconnects your call  
D - DOWNLOAD a file FROM the PBBS  
H - HELP information file  
I - INFORMATION about this PBBS  
J - List of calls heard by this PBBS  
    JK - Connected  
    JA - heard on TNC-A,  
    JB - heard on TNC-B, etc.  
K - KILL a message  
    K x - a specific message  
    KM - Mine that I have read  
L - LISTs messages in the mailbox  
    L - New messages since last using the L command  
    LM - Only messages to you (List Mine)  
    LN - Only unread messages to you (List New)  
    LT - List NTS Traffic (NTS Traffic Handlers)  
    LL 10 - List last 10 messages  
    L< callsign - Messages from 'callsign'  
    L> callsign - Messages to 'callsign'  
    L@ callsign - Messages sent care of 'callsign'  
    L x - Messages above a given number 'x'  
    L x y - Group of messages from 'x' to 'y'  
N - NAME - N (your first name)  
R - READ messages (not "files") without forwarding headers  
    R x - Message number 'x' - up to 6 message numbers  
    RM - Messages addressed to you  
    RN - New messages addressed to you  
S - SEND messages (not "files")  
    S callsign - Send message to 'callsign'  
    SP callsign - Send private message to 'callsign'  
    S callsign @ pbbs callsign - Send message to a station  
                                    at another PBBS  
    ST NTSxx - Send NTS traffic for 'xx' state (NTS  
                                    handlers)  
    SB ALL - Send a general Bulletin addressed to ALL  
T - TALK to the SysOp - pages the PBBS System Operator  
U - UPLOAD a file TO the PBBS  
V - PBBS software VERSION, number of active messages, next  
    message number  
V - VERBOSE READ messages including forwarding headers  
    V x - Message number 'x' - up to 6 message numbers  
    VM - Messages addressed to you  
    VN - New messages addressed to you  
W - WHAT's available (File Section Directory)  
X - EXPERT Status - EXTENDED prompt line  
Y - YAPP Binary File Transfer - Y alone same as ?Y  
    Y or ?Y or YH - YAPP help file  
    YW - Binary file directory (What)  
    YN - Binary new files (What New)  
    YU - YAPP Upload  
    YD - YAPP Download

1 2 3 4 5



